



YOUR WATER. YOUR FUTURE.

**Irrigation Efficiency: Building Bridges Through
Conservation and Drought Resilience**

ORESTES MORFÍN – SENIOR ANALYST, COLORADO RIVER PROGRAMS

July 11, 2022

Why now?

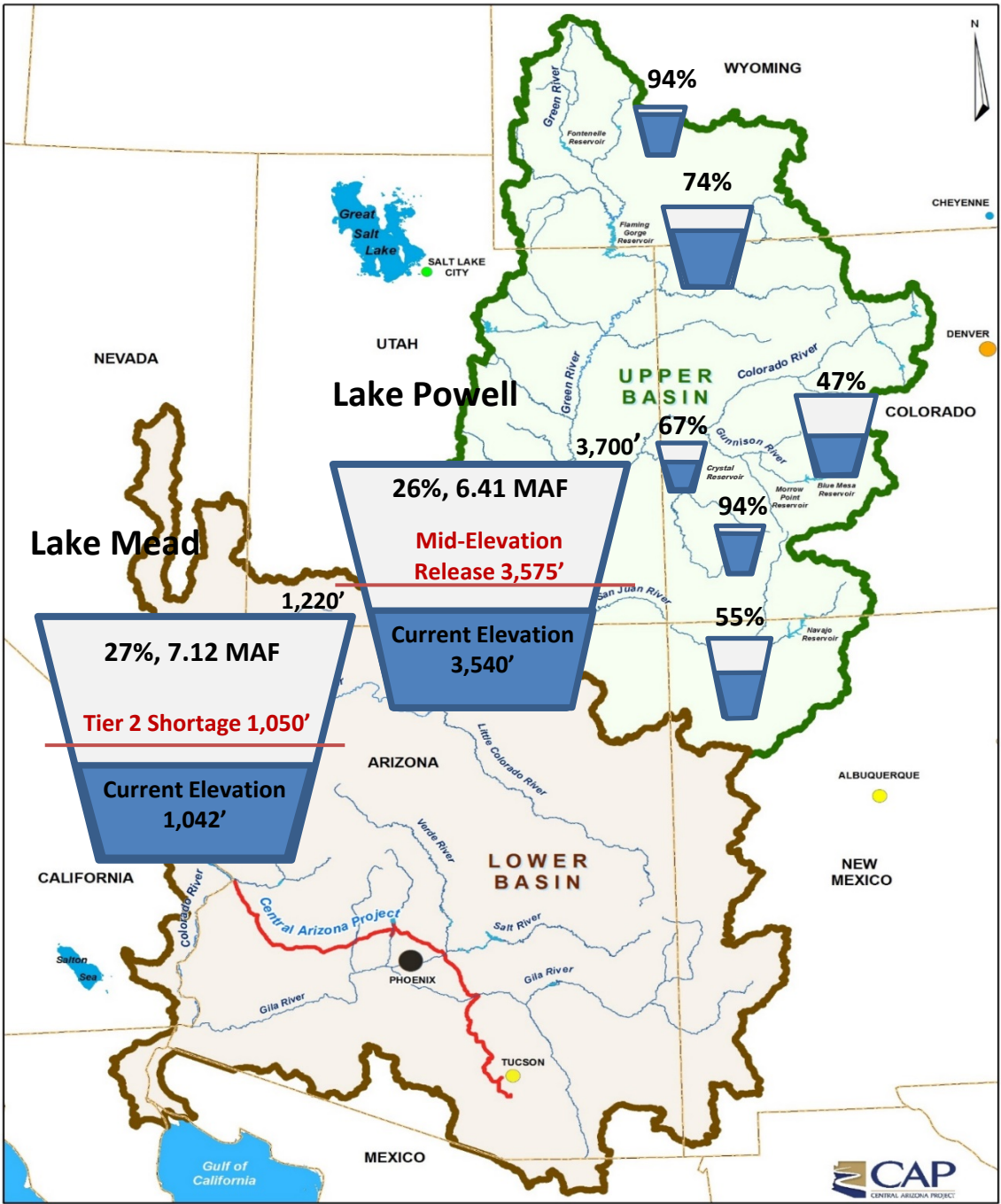


Colorado River Water Supply Report

System Contents: 18.08 MAF

As of July 10, 2022

Last Year System Contents: ~24.79 MAF



Reservoir Capacities (MAF)			
Reservoir	Current	Change*	Maximum
Lake Mead	7.12	- 0.54	25.90
Lake Powell	6.41	+ 0.28	24.30
Flaming Gorge Reservoir	2.78	- 0.07	3.75
Fontenelle Reservoir	0.32	+ 0.17	0.34
Navajo Reservoir	0.93	- 0.02	1.70
Blue Mesa Reservoir	0.39	+ 0.08	0.83
Morrow Point Reservoir	0.11	0.00	0.12
Crystal Reservoir	0.02	0.00	0.03

* With respect to May 24, 2022

US Bureau of Reclamation - June 14th Announcement

- Investments in Drought Response Actions
 - Additional \$38M in Drought Resiliency Projects
 - Additional \$17.3M in Water and Energy Efficiency grants in 11 Western states
- Water reuse/recycling
 - \$1B tbd over 2022-2024 period
- Bipartisan Infrastructure Law
 - Funding available to accelerate project development for “new water supplies”
 - Recycling, storage, desalination, drought contingency plans
- Added Essentials
 - Acknowledgment of additional 2-4 MAF needed to prop up system
 - Commitment to “protect the system (infrastructure)”
 - “Equitable” distribution of reductions

Options

- Conservation
 - *Municipal & Industrial*
 - *Agricultural Fallowing*
- Weather augmentation
- Transfers of entitlement
- Intentionally Created Surplus incentives
- Desalination
 - *Seawater*
 - *Brackish groundwater*
- Water reuse/recycling
- Agricultural efficiency
 - *Irrigation efficiency*
 - *Canal lining*
 - *Piping*



N-Drip™ : Promising Technology Against Climate Change

The water crisis in Southwest USA is accelerating



Colorado River, US

Sustainable supply chain is a core concern



Potatoes, India

GHG emissions from flood-irrigated rice are equal to emissions from more than 135M cars



Rice paddy, India

Furrow (Flood) Irrigation



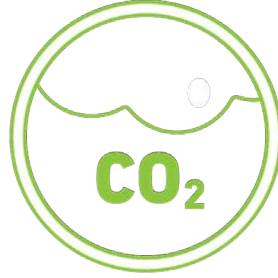
Water
Waste



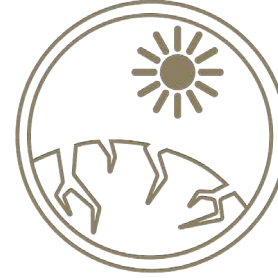
Lower
Yield



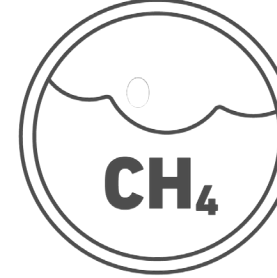
Fertilizer
Overuse



Greenhouse
Gases



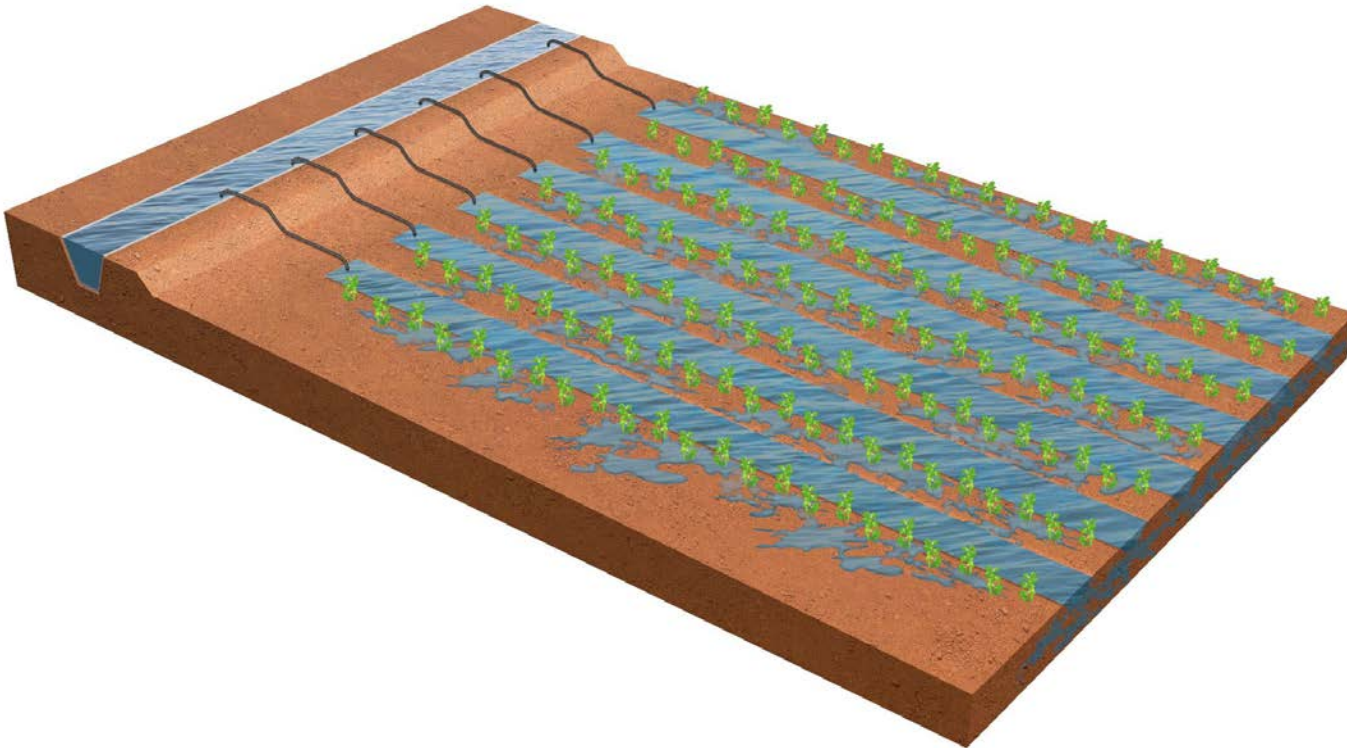
Soil
Erosion



Methane



Hard
Labor



In Arizona:

- 70% of Colorado River allotment is used for Ag
- 70% of all Ag in AZ is flood-irrigated

...~50% of AZ allotment is used for flood

N-Drip System Components



Saves Water

up to 60 percent of the water used for flood irrigation



Reduces Fertilizer Use

Saves up to 50 percent of total fertilizer costs, and reduces algal blooms and groundwater contamination

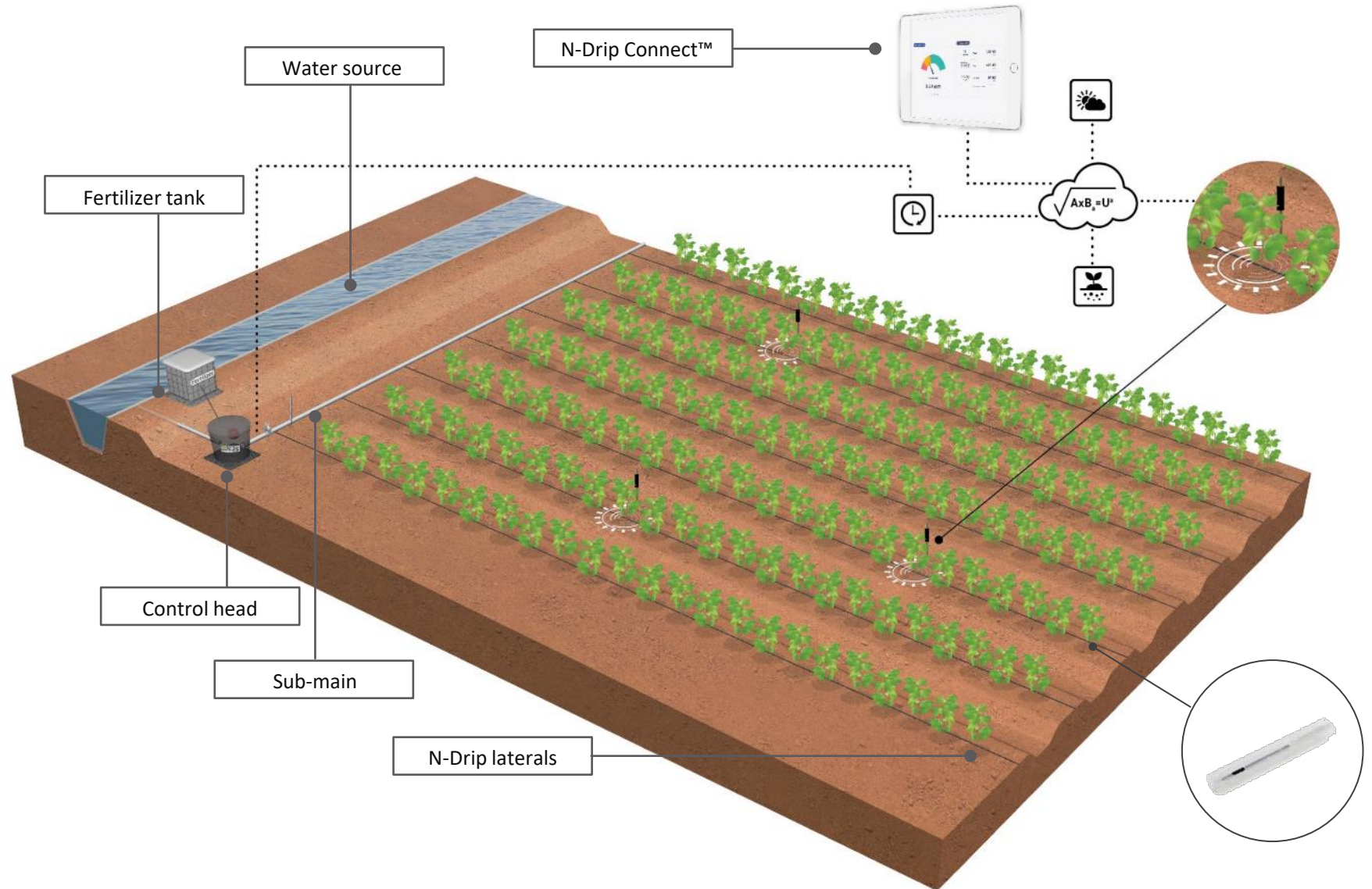


Up to 80% reduction in CO₂ + CH₄ emissions



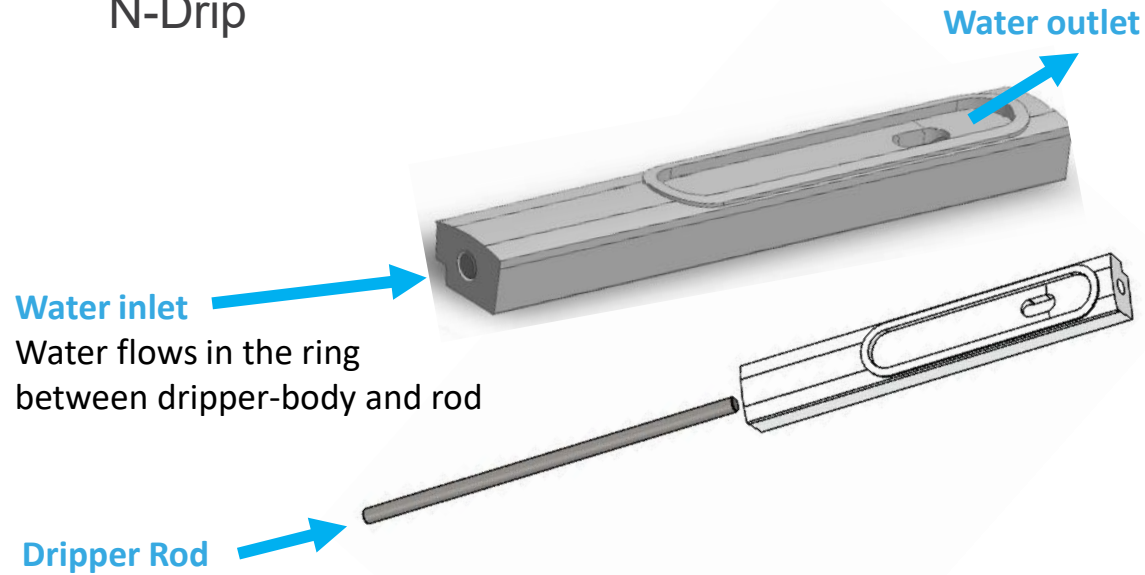
Maximizes Yield Potential

30 percent greater than a comparable flood irrigated field



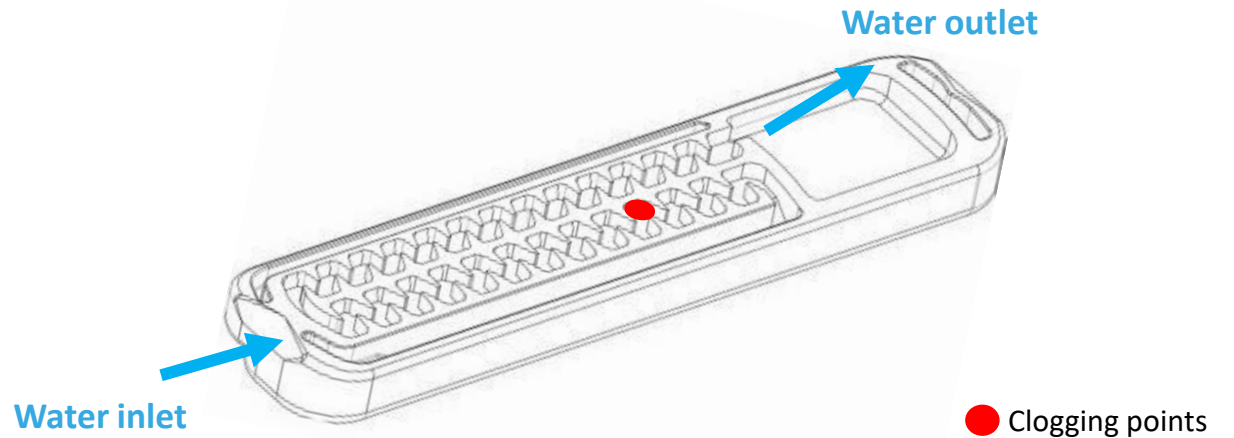
Proprietary Emitter

N-Drip



- ✓ Uses existing infrastructure
- ✓ No pumping station (no energy)
- ✓ No pressure-based filters

Traditional



- × Massive infrastructure
- × Energy intensive
- × Heavy filtration

Partnership Details

- Applying N-Drip technology, developed in Israel, on CRIT fields to test water savings and agricultural productivity
- The gravity-powered, micro-irrigation system was tested against traditional flood irrigation
- This innovative technology is cost-effective and easy to implement – no need for new infrastructure or power requirements
- Partners include:
 - CRIT – field and farming experience
 - CAP – funding and interest in saving Colorado River water
 - N-Drip –gravity-powered, micro-irrigation and real-time soil monitoring
 - UA – data gathering and research



*N-Drip/CRIT On-Farm Team:
Miguel Gonzalez (CRIT Farms),
Buddy Moore (CRIT Farms Manager), Uri Segev (N-Drip)*

Conservation Partner: Colorado River Indian Tribes (CRIT)

- Colorado River Indian Tribes (CRIT)
 - Sovereign Indian tribe with a first-priority Colorado River water right
 - Served by outdated, poorly maintained irrigation project in need of extensive renovation
- CRIT provides --
 - Farming expertise
 - Stewards of Colorado River water who have farmed the region for millennia
 - Fields
 - Testing N-Drip technology under challenging climatic circumstances in the remote environment near Parker, Arizona
 - 40 acres of sorghum in [2020](#), 100 acres of sorghum, 40 of cotton, and 100 of alfalfa in [2021](#), 286 acres of sorghum and 300 acres of cotton in [2022](#)



Conservation Partner: Central Arizona Project (CAP)

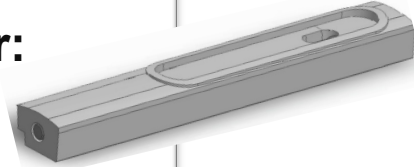
- CRIT and CAP worked together to develop alternatives to traditional fallowing with the aim of saving Colorado River water and sustaining irrigated agricultural productivity
- CAP is looking for solutions to preserve the Colorado River and balance the future water needs of Tribes, cities and agriculture
- CAP provides –
 - Funding for conservation technology and research
 - Facilitation to broaden the application of innovative water conservation technology for future implementation



Conservation Partner: N-Drip

Proprietary (IP protected) dripper:

- Multi-dimensional flow, anti-clogging
- Designed to provide efficient drip irrigation with only 50 cm (20 inches) of pressure
- Resilient to unfiltered water



Here's how N-Drip works

N-Drip's Benefits:

Cost effective

Lowest conversion & operational **costs**

Energy saving

Powered by gravity alone

Highly efficient

Increase yields using less water

Eco-friendly

100% recyclable, reduces greenhouse gas emissions

Modular

Easy to install and uninstall, seasonal and flexible

Conservation Partner: University of Arizona (UA)

- The related research being developed from this pilot project includes analysis and monitoring for:
 - Water quantity
 - Water quality
 - Soil health
 - Crop health
 - Crop productivity
 - System performance
- Direct comparison of N-Drip fields to flood-irrigated fields



THE UNIVERSITY OF ARIZONA
COLLEGE OF AGRICULTURE & LIFE SCIENCES
**Maricopa Agricultural
Center**
Experiment Station

Field Application – CRIT



Field Application – Yuma Mesa IDD

Flood



N-Drip



Field Application – Bard Irrigation District



High-Pressure Drip
Equipment:
filters, pumps, valves

N-Drip
Equipment:
water tank, valves

Field Application – Harquahala Vy. AZ



Arizona



October 2021



Alfalfa



43-acre



Sandy loam



Real-Time Data

Monitor

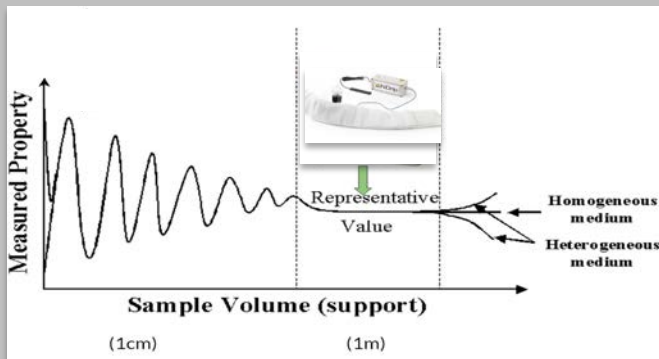
Water status,
nitrogen levels,
vegetative index,
field viability

Act

When and how much
to irrigate and
fertigate

Optimize

Yield, water, harvest-
time, emissions,
contamination



Proven Results - Arizona

- 2020
 - CRIT
 - Sorghum: 40 ac., 52% savings
- 2021
 - CRIT
 - Sorghum: 106 ac., 47% savings
 - Alfalfa: 100 ac., 50% savings (based on first cutting)
 - Cotton: 44 ac., 40% savings
 - Tonopah/Harquahala
 - Cotton: 40 ac., 30% savings
 - Alfalfa: 100 ac., 50% savings (based on first cutting)

2022 – 2023 Projects to Program Level

- **2022**

<u>Project</u>	<u>Scale</u>	<u>Crop</u>	<u>Notes</u>
• <i>CRIT Farm-scale Project</i>	~300 acres	Milo	Expansion to Farm scale demonstration
• <i>Yuma Mesa Irrigation and Drainage District</i>	~270 acres	Citrus	Pilot-scale Demonstration multi-year
• <i>Harquahala Valley Irrigation District</i>	~100 acres	Alfalfa	Multi-year alfalfa Demonstration ('22 – '23) – “Big 5 Funders”
• <i>CRIT Farms</i>	~100 acres	Alfalfa	Multi-year alfalfa Demonstration ('22 – '23) – “Big 5 Funders”
• <i>Seeking CAP Tribal partners (GRIC, TON)</i>	~100 acres	TBD	Pilot-scale Demonstration

- **2023**

<u>Project</u>	<u>Scale</u>	<u>Crop</u>	<u>Notes</u>
• <i>CRIT Farm-scale continued</i>	TBD	TBD	
• <i>YMIDD Farm Scale</i>	TBD	TBD	
• <i>Mexicali Valley Pilot</i>	~400 acres (5 x 80 acres)	TBD	Binational Demonstration and capacity-building – Binational Funder
• <i>CAP Tribal Partners continued</i>	TBD	TBD	Demonstration and capacity-building

- **2023 – 2026 Develop and Implement Colorado River Conservation Subscription Program**

- **Assuming continued demonstration of success and cost competitive with other alternatives**

2022 – 2023 Projects to Program Level



Central Utah Project



SOUTHERN NEVADA
WATER AUTHORITY™



CAP
CENTRAL ARIZONA PROJECT



KNOW YOUR WATER

Thank you

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